

THAT WHICH IS CLAIMED:

1. An apparatus for ultrasonically inspecting a structure comprising:
a driven probe disposed proximate a first surface of the structure, said
5 driven probe comprising a magnet and an ultrasonic transducer for inspecting the
structure as said driven probe is moved over the first surface of the structure; and
a tracking probe disposed proximate an opposed second surface of the
structure, said tracking probe also comprising a magnet for cooperating with the
magnet of said driven probe to draw the driven and tracking probes toward the first
10 and second surfaces of the structure, respectively, wherein magnetic attraction
between said driven and tracking probes causes said tracking probe to be moved over
the second surface of the structure in response to corresponding movement of said
driven probe.
- 15 2. An apparatus according to Claim 1 wherein said driven probe further
comprises an inlet for liquid that is bubbled between the ultrasonic transducer and the
first surface of the structure.
- 20 3. An apparatus according to Claim 2 wherein said driven probe further
comprises a housing in which the magnet and the ultrasonic transducer are disposed
and which defines the inlet, and wherein the inlet is in communication with that
portion of the ultrasonic transducer that faces the first surface of the structure.
- 25 4. An apparatus according to Claim 2 wherein the liquid bubbled between
the ultrasonic transducer and the first surface of the structure serves as a water
bearing.
- 30 5. An apparatus according to Claim 1 wherein said tracking probe further
comprises an ultrasonic transducer for communicating with the ultrasonic transducer
of said driven probe.
6. An apparatus according to Claim 5 wherein said tracking probe further
comprises an inlet for liquid that is bubbled between the ultrasonic transducer and the
second surface of the structure.

7. An apparatus according to Claim 6 wherein said tracking probe further comprises a housing in which the magnet and the ultrasonic transducer are disposed and which defines the inlet, and wherein the inlet is in communication with that
5 portion of the ultrasonic transducer that faces the second surface of the structure.

8. An apparatus according to Claim 6 wherein the liquid bubbled between the ultrasonic transducer and the second surface of the structure serves as a water bearing.
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9. An apparatus according to Claim 1 wherein said driven probe comprises at least one contact member for contacting the first surface of the structure such that said driven probe is capable of riding therealong.

10. An apparatus according to Claim 9 wherein said at least one contact member comprises a plurality of wheels.
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11. An apparatus according to Claim 1 wherein said tracking probe comprises at least one contact member for contacting the second surface of the
20 structure such that said tracking probe is capable of riding therealong.

12. An apparatus according to Claim 11 wherein said at least one contact member comprises a plurality of wheels.

13. An apparatus according to Claim 1 wherein the ultrasonic transducer of said driven probe comprises an array of ultrasonic transducers.
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14. An apparatus according to Claim 1 wherein said driven and tracking probes each comprises an array of magnets, and wherein at least one element of the
30 array of each probe is different than the other elements to thereby serve as a magnetic key.

15. An apparatus for inspecting a structure comprising:
a driven probe disposed proximate a first surface of the structure, said driven probe comprising a magnet and at least one contact member for contacting the first surface of the structure such that said driven probe is capable of riding
5 therealong; and
a tracking probe disposed proximate an opposed second surface of the structure, said tracking probe also comprising a magnet for cooperating with the magnet of said driven probe to draw the driven and tracking probes toward the first and second surfaces of the structure, respectively, wherein magnetic attraction
10 between said driven and tracking probes causes said tracking probe to be moved over the second surface of the structure in response to corresponding movement of said driven probe, and
wherein at least one of said driven probe and said tracking probe further comprises a sensing element for inspecting the structure as said driven probe is
15 moved over the first surface of the structure.

16. An apparatus according to Claim 15 wherein the sensing element is selected from the group consisting of an x-ray detector and a camera.

20 17. An apparatus according to Claim 15 wherein the sensing element comprises an ultrasonic transducer.

18. An apparatus according to Claim 17 wherein said driven probe comprises the ultrasonic transducer and further comprises an inlet for liquid that is
25 bubbled between the ultrasonic transducer and the first surface of the structure.

19. An apparatus according to Claim 18 wherein said driven probe further comprises a housing in which the magnet and the ultrasonic transducer are disposed and which defines the inlet, and wherein the inlet is in communication with that
30 portion of the ultrasonic transducer that faces the first surface of the structure.

20. An apparatus according to Claim 17 wherein both said driven probe and said tracking probe comprise an ultrasonic transducer for communicating therebetween.

21. An apparatus according to Claim 20 wherein said tracking probe further comprises an inlet for liquid that is bubbled between the ultrasonic transducer and the second surface of the structure.

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22. An apparatus according to Claim 21 wherein said tracking probe further comprises a housing in which the magnet and the ultrasonic transducer are disposed and which defines the inlet, and wherein the inlet is in communication with that portion of the ultrasonic transducer that faces the second surface of the structure.

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23. An apparatus according to Claim 21 wherein the liquid bubbled between the ultrasonic transducer and the second surface of the structure serves as a water bearing.

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24. An apparatus according to Claim 17 wherein the ultrasonic transducer comprises an array of ultrasonic transducers.

25. An apparatus according to Claim 15 wherein said at least one contact member comprises a plurality of wheels.

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26. An apparatus according to Claim 15 wherein said tracking probe comprises at least one contact member for contacting the second surface of the structure such that said tracking probe is capable of riding therealong.

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27. An apparatus according to Claim 26 wherein said at least one contact member comprises a plurality of wheels.

28. An apparatus according to Claim 15 wherein said driven and tracking probes each comprises an array of magnets, and wherein at least one element of the array of each probe is different than the other elements to thereby serve as a magnetic key.

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29. A method of inspecting a structure comprising:
positioning a driven probe proximate a first surface of the structure and
a tracking probe proximate an opposed second surface of the structure;
establishing magnetic attraction between the driven and tracking
5 probes such that the driven and tracking probes are drawn toward the first and second
surfaces of the structure, respectively;
moving the driven probe along the first surface of the structure which
causes the tracking probe to be correspondingly moved along the second surface of
the structure; and
10 transmitting ultrasonic signals into and receiving ultrasonic signals
from the structure as the driven probe is moved along the first surface of the structure.

30. A method according to Claim 29 wherein the driven probe moves
along the first surface of the structure in response to the application of motive force,
15 and wherein the tracking probe moves along the second surface of the structure in
response to movement of the driven probe along the first surface of the structure and
independent of the application of any other motive force.

31. A method according to Claim 29 further comprising bubbling a liquid
20 between the driven and tracking probes and the first and second surfaces of the
structure, respectively, while ultrasonic signals are transmitted into and received from
the structure.

32. A method according to Claim 29 wherein positioning the driven and
25 tracking probes proximate the first and second surfaces of the structure, respectively,
comprises disposing the driven and tracking probes in contact with the first and
second surfaces of the structure, respectively.

33. A method according to Claim 29 wherein transmitting and receiving
30 the ultrasonic signals comprises transmitting ultrasonic signals from one of the driven
and tracking probes and receiving the ultrasonic signals after passing through the
structure with the other of the driven and tracking probes.